The Project HOPE
CENTER for HEALTH AFFAIRS

STATISTICAL PROPERTIES OF PHYSICIAN SURVEYS

Proxy Response and Survey Error:

Additional Evidence from the

1988 Physicians' Practice Costs and Income Survey

Final Report

Curt Mueller
Marc Berk

August 1993

Submitted by:

Project HOPE
Center for Health Affairs
Bethesda, MD

Submitted to:

Health Care Financing Administration
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The statements contained in this report are solely those of the authors and do not necessarily reflect the views or policies of the Health Care Financing Administratio Project HOPE Center for Health Affairs assumes responsibility for the accuracy an completeness of the information contained in this report.

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PREFACE

The authors would like to thank Sara Thran of the American Medical Association for her assistance in developing this report. Ms. Thran was a co-author of a paper presented at the 1993 Meetings of the American Statistical Association which serves as the basis for Chapter 4 of this report. The assistance of Nancy McCall, the former HCFA project officer was also invaluable in developing our evaluation. The authors appreciate excellent help from Debbie Standifer Francis in preparing this document.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

1.1 Background 1-1
1.2 Overview 1-2

CHAPTER 2: FACTORS RELATED TO USE OF A PROXY RESPONDENT

2.1 Overview 2-1
2.2 Framework 2-2
2.3 Methods 2-3

2.3.1 Data 2-3
2.3.2 Model and Hypotheses 2-3

2.4 Findings 2-7

2.4.1 Descriptive Statistics 2-7
2.4.2 Multivariate Estimates 2-12

2.5 Implications 2-19

CHAPTER 3: SOME EVIDENCE ON THE RELATIONSHIP BETWEEN PROXY USE AND DATA QUALITY

3.1 Overview 3-1
3.2 Framework and Methods 3-2
3.3 Findings 3-4

3.3.1 Don't Know Rates 3-4
3.3.2 Detail Rates 3-6

3.4 Implications 3-8

CHAPTER 4: SHOULD SURVEY DATA BE USED TO ESTIMATE PHYSICIAN PRACTICE COSTS?

4.1 Background 4-1
4.2 Types of Error 4-2

4.2.1 Sampling Error 4-2
4.2.2 Coverage Error 4-2
4.2.3 Nonresponse Error 4-3
4.2.4 Measurement Error 4-7

4.3 Findings and Conclusions 4-10

REFERENCES R-1

APPENDIX: Rates of Refusal for Physician and Proxy Respondents, by Size of Practice A-1

LIST OF TABLES

Table 2-1: Practice Characteristics by Respondent Type 2-8

Table 2-2: Data Collection Timing and Mode by Respondent Type 2-11

Table 2-3: Variables Used in Regression Analysis of Whether a Proxy Respondent Provided PPCIS Cost Data 2-13

Table 2-4: Regression Equations Examining Whether a Proxy Respondent Provided PPCIS Cost Data 2-15

Table 2-5: Predicted Likelihoods of Proxy Use by Geographic Location and Practice Size 2-18

Table 3-1: "Don't Know" (DK) Rates for Physician and Proxy Respondents, by Size of Practice 3-5

Table 3-2: Detail Rates for Physician and Proxy Respondent, by Size of Practice 3-7

Table 4-1: Response Rates of Government-Sponsored Surveys of Practice Costs 4-4

Table 4-2: The Product of Survey Response and Item Response Rates for Selected Practice Costs Questions 4-8

CHAPTER 1:

INTRODUCTION

1.1 Background

The 1988 Physicians' Practice Costs and Income Survey (PPCIS) is the most recent of a series of physician surveys conducted for the Health Care Financing Administration (HCFA). One of its main purposes was to obtain data on the costs of medical practice. Such data have been used to support policy-relevant analyses of the composition of practice costs and geographic differences in the costs of practice (Thalji et al., 1991). Data needs are likely to increase in the future as the new Medicare Fee Schedule is refined and as the health care system is reformed. Evaluations and assessments of previous survey efforts are important sources of information that can be used to help design data collection strategies to meet future needs.

This report complements an earlier report prepared by the Project HOPE Center for Health Affairs (Project HOPE, 1991). A goal of this project has been to provide HCFA with information specific to the 1988 version of the PPCIS. This information may be helpful in HCFA's deliberations on whether a survey effort of the type represented by the PPCIS should be administered by HCFA in the future and whether design changes should be made, or whether other data collection strategies should be explored to meet HCFA's needs.

1.2 Overview

In the PPCIS, practice cost data were provided by surveyed physicians or -- for approximately one-half of all surveyed practices -- by a proxy respondent, such as an office or business manager. An interesting finding documented in the earlier report was a PPCIS "design effect" associated with respondent type. Total practice costs reported by proxy respondents were about 60 percent less than costs reported by physicians themselves. This effect was observed using an empirical specification that has traditionally been in cost analyses. The specification "controls" for a number of other factors that have been shown to affect the costs of providing physician's services.

One of the specific purposes of this report is further examine the design effect because its impact is large and because proxy respondents are often used as sources of cost data in physician's surveys as a means of increasing response rates. Specifically, Chapters 2 and 3 address the following questions: For what type(s) of practices were cost data provided by the physician versus a proxy respondent? Is there any evidence that physicians or proxy respondents are more knowledgeable about practice costs? Results of this analysis indicate that there are systematic differences in practices for which physicians and proxy respondents provided practice cost data. Furthermore, evidence from the 1988 PPCIS suggests that proxy respondents in larger practices are more knowledgeable about practice costs than physician respondents.

In the final chapter of the report, sources of survey error that are applicable to practice cost surveys are reviewed. Survey participation and item nonresponse rates of the 1988 PPCIS are compared with those of similar public and private physician surveys. Evidence of the occurrence of logical inconsistencies in the 1988 PPCIS data is also reviewed. The chapter concludes by questioning whether national surveys are the best vehicles for obtaining practice cost information. Some alternative data collection strategies are discussed.

CHAPTER 2:

FACTORS RELATED TO USE OF A PROXY RESPONDENT

2.1 Overview

In the 1988 PPCIS, data on each practice were provided by the physician or by the physician and proxy respondents.[1] Survey design permitted proxy respondents to answer certain questions -- including those on practice costs -- that could be answered using practice records. Use of proxy respondents was permitted to help alleviate the burden of survey participation on physicians (Thalji et al., 1991). This flexibility is important in obtaining maximum practice participation -- especially in surveys such as the PPCIS that are used to affect physician payment and other public policies. At the same time, it is important to remember that survey design features sometimes involve tradeoffs. On the one hand, use of proxy respondents can improve response rates; on the other hand, survey methodologists have long recognized that their use may introduce biases if the quality or validity of the data varies by respondent type.

As noted in Chapter 1, evidence from a multivariate analysis of practice costs indicates that costs differ between practices for which physicians responded to the PPCIS and practices for which proxy respondents provided answers to the cost questions. The purpose of the work presented in this chapter is to characterize practices by type of respondent. Such information will be of help in trying to understand the source of the design effect. Furthermore, if practices exhibit systematic variations by type of respondent, then if may be

[1]Survey data were provided entirely by proxy for 50 practices -- less than 1.5 percent of respondents.

possible to implement special survey design features to ensure that data of comparable quality are obtained from each type of practice.

The next section describes the conceptual framework that underlies the empirical specifications that are presented in Section 2.3. Findings based on a multivariate analysis of PPCIS data are presented in Section 2.4. The chapter concludes with a discussion of implications.

2.2 Framework

The physician's decision to participate in a survey such as the PPCIS can be analyzed within the framework of the economic theories of the firm and production. Marder and Thran (1989) model the physician's participation in the American Medical Association's (AMA's) Socioeconomic Monitoring System (SMS) surveys. They assume that physicians seek to minimize the cost of practice. The economic value or return to the physician's time -- measured by the physician's wage -- is endogenous in their model. Survey participation is one of several activities on which the physician may spend his or her time. In this analysis, a simpler, two-stage decision model is assumed. It is assumed that the physician behaves as if he or she were maximizing satisfaction associated with income and leisure. Hours of work is determined in the first stage. In the second stage, the physician decides how to allocate working hours and other practice inputs across the various activities of the practice.

Practice activities include direct patient care (including care provided in the office as well as in alternative settings such as the nursing home and hospital); administrative activities; and other activities such as continuing education. Under the standard assumption that the physician maximizes profit (and minimizes the cost of production), resources are used in production so long as the contribution of the "last" unit of each resource exceeds its marginal cost to the practice -- in economic jargon, as long as its marginal revenue product exceeds its marginal cost. Thus, the physician's time is allocated among activities so that the marginal revenue product in each activity equals the marginal cost of the physician's time in

that activity. Within this framework, whether and to what extent the physician engages in an activity depends on the determinants of the demand for physicians' services and the determinants of the cost of production.[2]

Empirical specifications studied in this analysis differ from the Marder-Thran specifications. A regressor in the Marder and Thran regression model of proxy response is the predicted value of the physician's wage, based on a model of the determination of the value of the physician's time. Instead, empirical specifications used in this study include reported hours worked by the physician (assumed to be determined prior to the decision of whether to participate in the survey). The empirical specifications below also distinguish between group practices of different sizes, whether groups are single or multispecialty, and whether the practice is incorporated -- factors not examined in detail by Marder and Thran.

2.3 Methods

2.3.1 Data

A multiple regression model was specified to identify factors that affect the physician's designation of a proxy respondent during fielding of the 1988 PPCIS. Data include variables collected directly from the survey respondent about the physician and the practice and variables describing the field experience compiled by survey personnel during the field period.

2.3.2 Model and Hypotheses

The dependent variable of the model is whether the physician delegated survey responsibilities to a proxy respondent. The theoretical framework can be used to help

[2] Marginal revenue product is derived from the demand relationship between price and quantity. In the same way, determinants of physician costs determine the marginal cost of services.

identify factors that potentially affect the physician's decision to delegate responsibility for the survey. Determinants of the "delegate decision" include determinants of demand for physician's services and determinants of the supply of services.

Demand Factors. There are numerous office activities associated with the production of physicians' services. Physicians are directly involved in patient care, and determine the extent of their involvement and delegation of tasks to other care providers including physicians' assistants, nurses, and technicians. Other office activities that must be staffed include various administrative and clerical functions that are complementary to service provision. The extent to which physicians allocate their own time to each of these activities depends on the value of the marginal unit of time in that activity, or how much the marginal unit of time affects the physician's marginal revenue product. Although certain types of personnel, such as physicians' assistants and nurses, can substitute directly for the physician in certain patient care activities, the value of the physician's time is greatest in patient care activities. In contrast, other types of personnel may have a comparative advantage in other activities, such as management of the practice's financial affairs (Scheffler, 1975).

The physician's opportunity cost of completing the survey depends on the physician's workload. A very busy physician -- for example, a physician who works longer hours than average, with a heavy patient load or many administrative responsibilities -- would be expected to rely on a proxy respondent more often that a less busy physician if the proxy respondent has a comparative advantage with financial dealings. The practice cost survey questions are likely to be more burdensome than other parts of the PPCIS questionnaire. Provision of accurate answers may require checking closely with the practice's financial records. In the models reported below, "busyness" is measured by the number of hours the physician worked during the preceding week and the number of hours squared (HOURS and HOURS_SQD in the tables below). Note that hours worked is included as an independent variable because their value is determined in the first stage of the two-stage model. In the Marder-Thran analysis, busyness is measured by the predicted value of the physician's wage.

Other variables that are included in the model to account for differences in the levels of demand facing individual physicians are whether the physician is board-certified, physician specialty, and geographic location. Evidence indicates that board certification may increase demand for patient care services (e.g. Wilensky and Rossiter, 1983; Marder and Thran, 1989), so a positive relationship between the categorical variable indicating certification (BRD_CERT) and delegation to a proxy respondent is expected a priori. Physician specialty is measured using a set of the re-coded specialty indicators from the PPCIS public use tape (defined according to American Medical Association conventions). Three specialty categories are included in the regression models to control for effects relative to surgical specialties: general and family practice (GEN), medical specialties (MED), and "other" specialties (OSPEC).

Two sets of categorical variables indicate the physician's geographic location: Federal Census region of the practice, and degree of urbanicity of the surrounding area. The Census region variables indicate whether the practice is located in the northeast Census region (NEAST), midwest (MIDWEST), or south (SOUTH), compared to the west. Categorical variables are used to indicate whether the practice was located in a large Standard Metropolitan Statistical Area (SMSA) (LG_SMSA) or rural area (NO_SMSA), compared to smaller SMSAs. Other market variables that measure demand determinants, such as per capita income and the number of physicians per capita, cannot be included in the model because the PPCIS does not identify specific practice locations within Census regions.

Supply Factors. Practice size is expected to directly affect the physician's decision to delegate responsibility. Practice size is directly associated with practice complexity. Review of financial records becomes more burdensome and cost-accounting becomes more complex in larger practices. An individual physician respondent is less likely to have a working familiarity with total practice costs as practice size increases. Larger practices may also experience scale economies. Such practices can more fully employ clerical personnel, such as bookkeepers and business managers, who may have more knowledge of day-to-day financial affairs than individual physicians.

The empirical specification of the proxy decision and the equation used to predict the physician's wage used by Marder and Thran contained a dummy variable to distinguish between solo and group practices. In this analysis, practice size is measured using a set of dummy variables to distinguish between solo practices and groups of different sizes. Categories have been constructed so that regression coefficients can be used to compare larger practices to the average solo practice. Categories are practices with the number of full-time equivalent physicians ranging from: one to three (DOCS1_3); three to five (DOCS3_5); five to eight (DOCS5_8); eight to 20 (DOCS8_20); and more than 20 (DOCS21).

Two additional practice characteristics, included in the model as measures of practice complexity, are whether the practice is a multi-specialty practice, and whether the practice is incorporated. It is hypothesized that physicians in multi-specialty practices (M_SPEC=1, versus 0 otherwise) are more inclined to delegate survey responsibilities because they are less likely to be familiar with practice costs of colleagues of different specialties. It is not obvious, a priori, whether physicians in incorporated practices (CORP=1, versus 0 otherwise) are more or less inclined to serve as survey respondents than solo or partnership physicians.

Field Variables. Finally, three variables that describe PPCIS field work by data collection personnel were included in the model to control for differences in field operations across practices: how late into the field period data collection at the practice began (HOW_LATE, measured in days from the beginning of the field period), how much time the data collection process required (HOW_LONG, also measured in days), and whether data were obtained using computer-assisted telephone interviewing (CATI) procedures rather than paper-and-pencil recording of responses with subsequent computerized data entry (CADE).[3]

[3] Under CATI – Computer Assisted Telephone Interviews – data are entered directly into a computer with built-in editing capabilities. Approximately 51 percent of interviews were completed using CATI. Computer Assisted Data Entry, or CADE, was used in the remainder of interviews. Interviewers recorded responses using paper and pencil. Data were entered into a computer at a later time.

It was hypothesized that lateness is directly associated with the likelihood that a proxy will be used because of pressures to complete data collection. The length of the data collection period, controlling for start date, should be directly related to use of a proxy respondent because reluctant physician participants would be more inclined to participate by proxy than more willing participants. A categorical variable for the use of CATI versus CADE procedures is included in the model because a CATI design effect was observed in Project HOPE's earlier analysis (Project HOPE, 1991).

2.4 Findings

Two types of empirical evidence are used to examine issues related to the physician's selection of respondent. First, some univariate statistics from the PPCIS data are used to compare practices of physician and proxy respondents. Second, estimates of the multivariate model are used to identify factors related to use of a proxy respondent.

2.4.1 Descriptive Statistics

The PPCIS data were used to profile practices of physician respondents and practices for which a proxy respondent provided PPCIS data (Table 2-1). Results suggest that busier physicians were somewhat more inclined to delegate practice cost questions to a proxy respondent. The average length of the preceding work week was about 2.5 hours less for the physician respondent than for the physician who delegated; 55 percent of physicians who were represented by a proxy worked at least 60 hours during the week prior to the survey, versus 50 percent of physician respondents.

The geographic location of practices for which respondents were used differs from the locations of physicians who completed the cost questions themselves. Relatively fewer practices represented by a proxy were located in the largest urban areas (Standard Metropolitan Statistical Areas, or SMSAs). Only 13 percent of physician-respondent practices were located in non-SMSAs, versus 17 percent of practices using a proxy. Fifty-

Table 2-1: Practice Characteristics by Respondent Type

Characteristic	Mean[a] (Standard Error) Proxy Respondent	Physician Respondent	Ratio
Physician's work hours, preceeding week:			
Hours	59.91 (0.45)	57.41 (0.37)	1.04
Fraction with 60 or more hours	0.55 (0.01)	0.50 (0.01)	1.10
Practice Location:			
Large SMSA	0.28 (0.01)	0.40 (0.01)	0.70
Small SMSA	0.55 (0.01)	0.47 (0.01)	1.17
Non SMSA	0.17 (0.01)	0.13 (0.01)	1.31
Practice Size:			
1 physician	0.40 (0.01)	0.64 (0.01)	0.67
1-3 physicians	0.24 (0.01)	0.18 (0.01)	1.33
3-5 physicians	0.13 (0.01)	0.08 (0.01)	1.63
5-8 physicians	0.07 (0.01)	0.04 (0.01)	b
8-20 physicians	0.10 (0.01)	0.03 c	3.33
More than 20 physicians	0.07 (0.01)	0.02 c	3.50

Table 2-1 (Cont'd): Practice Characteristics by Respondent Type

Characteristic	Mean[a] (Standard Error) Proxy Respondent	Physician Respondent	Ratio
Physician is in a multispecialty practice	0.17 (0.01)	0.07 (0.01)	2.43
Practice is incorporated	0.64 (0.01)	0.49 (0.01)	1.31

Source: Analysis of 1988 PPCIS data by Project HOPE.
Notes: [a]Means and standard errors are weighted. [b]The ratio is not reported when the difference between proxy and physician means is not statistically significant at an alpha level of 0.01. [c]Value less than 0.005.

one percent of physicians in non-metropolitan areas delegated survey responsibilities, whereas only 36 percent in the largest metropolitan areas designated a proxy respondent (not displayed in Table 2-1). Historically, physicians in non-metropolitan areas have worked longer hours and more weeks per year (American Medical Association, 1990). These findings are consistent with the relationship between use of a proxy respondent and hours of work displayed in Table 2-1.

Practice size and complexity are also related to use of a proxy respondent. Solo practitioners comprise 64 percent of practices for which the physician responds, and only 40 percent of practices for which proxy respondents were used. Two-thirds of solo practitioners answered the practice cost questions themselves (not displayed in Table 2-1). By contrast, 17 percent of proxy respondents are in groups of eight or more doctors, whereas only five percent of physician-respondents are in practices this large. Seventy-six percent of all physicians in groups of eight or more delegated survey responsibility.

Proxy respondents are more likely to be used by physicians in multi-specialty groups. Seventeen percent of proxy respondents are in multi-specialty groups, versus seven percent of practices with physician respondents. Relatively more of unincorporated practices were represented by physicians than by proxy respondents.

Although there was no statistically significant difference between the start of data collection in practices that differed with respect to type of respondent, respondent type is related to the period of time required to complete data collection and data collection mode (Table 2-2). The survey was in the field longer for practices for which a proxy respondent was used than when a physician provided the practice cost information. It is quite likely that proxy respondents were used in some instances because physicians had not provided data in a timely manner. Data collection using CATI was also more common in practices for which physicians answered the cost questions.

Table 2-2: Data Collection Timing and Mode by Respondent Type

	Mean[a] (Standard Error) Proxy Respondent	Physician Respondent	Ratio
Timing of Data Collection:			
Days between start of data collection and 1/1/89	292.01 (2.20)	287.14 (1.85)	b
Days between completion of data collection and 1/1/89	333.50 (2.17)	316.69 (1.90)	1.05
Data Collection Mode:			
Computer-assisted telephone interview (CATI)	0.44 (0.01)	0.58 (0.01)	0.76

Source: Analysis of 1988 PPCIS data by Project HOPE.
Notes: [a]Means and standard errors are weighted. [b]The difference between the proxy and physician means is not statistically significant at an alpha level of 0.01.

2.4.2 Multivariate Estimates

The univariate statistics displayed in Table 2-1 is consistent with the key hypotheses of the model that busy physicians and physicians in larger practices are more likely to delegate practice cost questions to proxy respondents. Nevertheless, relationships between demand and supply factors and type of respondent should be examined after controlling for other physician and practice characteristics. Descriptive statistics for the sample physicians included in the multivariate model are presented in Table 2-3; estimation results are presented in Table 2-4.

Three versions of a linear probability model were estimated using ordinary least squares.[4] The first specification (Model 1) includes all independent variables. The second and third specifications are presented to highlight the relative contributions of the busyness, practice characteristics, and field variables. In the second specification (Model 2), field variables are deleted; field and practice size variables are deleted in the third specification (Model 3).

Regression results indicate that practice size and complexity account for much of the variation in respondent type. The simplest equation -- Model 3, including only the busyness and other physician characteristics variables -- accounts for only 4 percent of the variation in respondent type (the R^2 value, adjusted for the number of independent variables, is 0.04). Introduction of the practice size and complexity variables increases the explained variation by eight percentage points (Model 2), while the field variables only contribute an additional one percent to the model's explanatory power (Model 3).

Geographic location and practice size are the most important determinants of respondent type. Furthermore, impacts of these variables are similar across the three

[4] The large sample size, and the fact that roughly half of the sample were proxy respondent practices, mitigate problems associated with the linear probability model relative to probit or logit models.

Table 2-3: Variables Used in Regression Analysis of Whether a Proxy Respondent Provided PPCIS Cost Data

Independent Variable	Description	Percent With Characteristics or Mean
Location of practice:		
NEAST	Northeast region	0.23
MIDWEST	Midwest region	0.21
SOUTH	South region	0.33
WEST	West region	0.23
LG_SMSA	Large SMSA	0.35
SM_SMSA	Small SMSA	0.50
NO_SMSA	Non SMSA	0.15
Physician's specialty:		
GEN	General practice	0.15
MED	Medical specialty	0.30
SURG	Surgical specialty	0.34
OSPEC	Other specialty	0.21
BRD_CERT	Physician is board-certified	0.74
HOURS	Physician's work hours, preceding week	58.55
HOURS_SQD	Hours, squared	3657.24
Number of full-time equivalent physicians in practice:		
SOLO	1 physician	0.55
DOCS1_3	1-3 physicians	0.20
DOCS3_5	3-5 physicians	0.10
DOCS5_8	5-8 physicians	0.05
DOCS8_20	8-20 physicians	0.06
DOCS22	More than 20 physicians	0.04
M_SPEC	Practice is a multispecialty group	0.12
CORP	Practice is incorporated	0.55

Table 2-3 (Cont'd): Variables Used in Regression Analysis of Whether a Proxy Respondent Provided PPCIS Cost Data

Independent Variable	Description	Percent With Characteristics or Mean
HOW_LATE	Days between start of data collection and 1/1/89	285.03
HOW_LONG	The number of days required to complete data collection	39.68
CATI	Data collection by computer-assisted telephone interview	0.53

Source: Analysis of 1988 PPCIS data by Project HOPE.
Note: Means and percents are weighted.

Table 2-4: Regression Equations Examining Whether a Proxy Respondent Provided PPCIS Cost Data

Independent Variable	Model 1	Model 2	Model 3
NEAST	-0.045 (0.026)	-0.038 (0.026)	-0.063* (0.027)
MIDWEST	0.032 (0.026)	0.030 (0.027)	0.050 (0.028)
SOUTH	0.028 (0.024)	0.030 (0.024)	0.018 (0.025)
GEN	-0.016 (0.028)	-0.011 (0.028)	-0.044 (0.029)
MED	-0.039 (0.022)	-0.039 (0.022)	-0.032 (0.023)
OSPEC	-0.214** (0.025)	-0.225** (0.025)	-0.192** (0.026)
BRD_CERT	-0.004 (0.021)	-0.003 (0.021)	0.056** (0.021)
LG_SMSA	-0.061** (0.020)	-0.058** (0.020)	-0.095** (0.021)
NO_SMSA	0.027 (0.026)	0.022 (0.026)	0.003 (0.027)
HOURS	-0.005* (0.002)	-0.005* (0.002)	-0.003 (0.003)
HOURS_SQD	a* a	a* a	a a
DOCS1_3	0.133** (0.023)	0.135** (0.024)	-
DOCS3_5	0.168* (0.031)	0.169** (0.031)	-

Table 2-4 (Cont'd): Regression Equations Examining Whether a Proxy Respondent Provided PPCIS Cost Data

Independent Variable	Model 1	Model 2	Model 3
DOCS5_8	0.218** (0.041)	0.222** (0.042)	-
DOCS8_20	0.361** (0.040)	0.366** (0.040)	-
DOCS21	0.370** (0.053)	0.388** (0.054)	-
M_SPEC	0.004 (0.033)	0.003 (0.033)	-
CORP	0.094** (0.019)	0.096** (0.019)	-
HOW_LATE	a a	-	-
HOW_LONG	a a	-	-
CATI	-0.112** (0.028)	-	-
Constant	0.595** (0.111)	0.494** (0.083)	0.531** (0.086)
F	21.16	21.83	12.72
Adjusted R-Square	0.13	0.12	0.04

Source: Project HOPE analysis of 1988 PPCIS data.
Notes: Mean values of dependent and independent variables are displayed in Table 2-3. Statistical significance of the regression coefficient is indicated as follows: ** at alpha level 0.01; * at alpha level 0.05.
a Value less than 0.005.

models. On average, physicians in the largest SMSAs were 16 percent (six percentage points) less likely to use a proxy than physicians in smaller SMSAs -- 0.39 probability in the largest SMSAs versus 0.45 in small SMSAs (Table 2-5). Physicians in non-metropolitan areas were the most likely to use a proxy (likelihood of 0.47, controlling for other factors.) It is interesting to note that results from the Marder-Thran analysis of the AMA's SMS survey are similar. Physicians in the largest SMSAs are less likely to delegate expense questions to proxy respondents than physicians in nonmetropolitan areas.

The impact of work hours -- the other measure of "physician busyness" -- is not consistent with prior expectations and the direct univariate relationship displayed in Table 2-1. After controlling for physician and practice characteristics, hours has a negative affect on proxy use (Table 2-4). On the other hand, the effect is very small in magnitude. A large increase in the length of the work week from the sample average of 58.6 hours (Table 2-3) to 70 hours would only reduce the probability of proxy use by 0.006 percentage points (from 0.429 to 0.423).

Practice size is directly related to proxy use, as hypothesized. Predicted estimates of the probabilities of proxy use increase monotonically with practical size. Practices with between one and three full-time-equivalent physicians are 37 percent more likely to use a proxy than solo practice physicians -- a predicted likelihood of 0.48 versus 0.35 for solo practices (Table 2-5). Physicians of the largest practices (practices with over eight full-time physicians) are over twice as likely to use proxies as solo practitioners. Again, comparisons with the Marder-Thran analysis are of interest. In their model, practice size is measured using a categorical variable that distinguished solo from target practices. Practice size doesn't affect use of proxy directly, but does affect proxy use via its effect on the predicted physicians's wage. Solo practice physicians have smaller wages than physicians in larger practices. As wages are directly related to proxy use, Marder and Thran also find that solo practitioners are less likely to use proxy respondents than physicians in larger practices.

Table 2-5: Predicted Likelihoods of Proxy Use by Geographic Location and Practice Size

	Estimated Likelihood[a]	Ratio[b]
Geographic Location:		
Metropolitan area, more than 1 million households	0.39	0.87*
Metropolitan area, less than 1 million households (R)	0.45	1.00
Non-metropolitan area	0.47	1.04
Practice Size:		
Solo (R)	0.35	1.00
1-3 physicians	0.48	1.37*
3-5 physicians	0.51	1.46*
5-8 physicians	0.56	1.60*
8-20 physicians	0.71	2.03*
More than 20 physicians	0.72	2.06*

Source: Analysis of 1988 PPCIS data by Project HOPE.

Notes: [a] Estimates based on Model 3 estimates, Table 2-4; variables other than geographic location and practice size were assigned their mean values.

[b] Calculated as the estimated likelihood divided by the likelihood for the reference category (R). An asterisk indicates that the regression efficient for the category (Table 2-4, Model 1)is statistically significant at the 0.05 level of confidence.

Variables indicating whether the practice is incorporated and whether it is a multispecialty practice were included in the model as measures of practice complexity. Incorporated physicians are nine percentage points more likely to use a respondent than unincorporated physicians (Table 2-4). While univariate statistics suggested that physicians in multispecialty groups were more likely to rely on proxy respondents (Table 2-2), there is no evidence of this association in the linear probability models.

Two measures of the timing of data collection activities are included in the full regression model (Table 2-4, Model 1) along with the CATI dummy variable. As noted above, the variable HOW_LATE is a measure of when data collection activities with the practice began. The variable HOW_LONG was constructed as a measure of elapsed time before data collection at the practice was completed. Only the CATI indicator variable was statistically significant at the conventional level of 0.05. Use of a proxy respondent and CATI procedures were negatively related, *ceterus paribus*. One explanation is that when proxy respondents are used, the CATI mode is discontinued for pencil-and-paper recording of practice cost responses. It should be noted that the effect of the CATI mode was one of the significant design effects noted in an earlier report on the PPCIS (Project HOPE, 1991).

2.5 Implications

Nonphysician proxy respondents are often used to provide information on practice costs as part of physician surveys that are used to affect policy. The PPCIS has been used to estimate the Medical Economic Index (MEI), an index that has been used to adjust Medicare fees over time. Approximately one-half of PPCIS practice cost respondents were proxies. In a similar fashion, many respondents to the AMA's SMS surveys -- used to develop the practice expense component of the new Medicare Resource-Based Relative Value Scale -- are proxy respondents.

This work was motivated by the finding of a design effect associated with the use of proxy respondents in the PPCIS. In particular, proxy respondents reported total practice

costs that were 60 percent of costs reported by physicians (Project HOPE, 1991). Results of this analysis confirm that systematic differences in practices exist between practices with physician and nonphysician respondents. For the PPCIS, proxy respondents were more likely to provide information on practice costs in larger practices, in practices in non-metropolitan and smaller metropolitan areas, and in practices that are incorporated. Marder and Thran (1989) observed consistent relationships between geographic area, practice size, and use of proxy respondents in the AMA's SMS: proxy respondents were used less frequently in large metropolitan areas, and the value of time of solo (as opposed to group) physicians is less, which decreases the likelihood that they will designate a proxy respondent.

A key question is whether data from both types of respondents are valid. If so, the design effect may be an artifact. Type of respondent may be associated with one or more practice characteristics that are not otherwise cohtrolled for in the estimated cost function -- an empirical specification that frequently is estimated by economists. For example, the design effect may be an indication that larger practices are more efficient than smaller practices. In particular, larger practices are more likely to hire personnel to assist with financial matters (and these persons served as proxy respondents). At best, however, this explanation is only a partial explanation because the practice differences identified above do not, by themselves, account fully for the design effect. First, only a relatively small amount of the variation in respondent type is explained by the regressions in this chapter. The model with the largest number of variables only explains 13 percent of the variation in respondent type. Second, the most important determinants of respondent type -- practice size and metropolitan area -- had statistically significant, independent effects on cost in the cost equations that exhibited the design effect. Thus, the design affect most likely reflects additional, independent factors as well as those observed above.

If, on the other hand, practice cost data from physicians and proxy respondents are not equally valid, the observed design effect may be real. The systematic differences leading to choice of respondent may introduce bias in practice costs estimates from the survey. In this case, special survey design procedures may be necessary to ensure that physicians and

proxy respondents are providing valid data. More information on the nature and quality of data provided by physicians and proxy respondents is needed.

CHAPTER 3:

SOME EVIDENCE ON THE RELATIONSHIP BETWEEN PROXY USE AND DATA QUALITY

3.1 Overview

There are at least two explanations that would account for the design effect associated with type of PPCIS respondent. As noted in Chapter 2, one explanation is that there are systematic differences between practices for which physicians versus proxy respondents provide practice cost data, and that these differences, rather than type of respondent per se, account for differences in costs. A second explanation is that there are differences in the validity of data provided by physicians and proxy respondents. Unfortunately, there are no data that permit comparisons of reported cost information provided by physicians and proxy respondents of the same practices.

In this chapter, data from the 1988 PPCIS are used to begin to address differences in the nature of data reported by physicians and proxy respondents. The central question is whether physician or proxy respondents are more knowledgeable sources of practice cost information. Answers to this question potentially affect the design of future surveys. Two indicators of knowledge are considered: the incidence of "Don't Know" responses to cost questions, and the ability or willingness of the respondent to provide detailed cost information as requested by the PPCIS. How these indicators are used is described in the next section. Findings and implications are discussed in sections 3.3 and 3.4.

3.2 Framework and Methods

A physician might designate a proxy respondent if he or she is simply too busy to respond to detailed questions on costs. Ideally, the designated proxy respondent is the best source of information on costs, but in fact, the respondent may or may not be more knowledgeable on cost issues than the physician. Small practices are less likely to have practice managers with focused cost-accounting responsibilities (Scheffler, 1975). By contrast, larger groups are able to hire specialized labor to assume managerial and financial responsibilities. A second reason a physician might delegate cost questions is that the physician feels that the proxy respondent would be more knowledgeable and readily able to provide the cost information. For example, a physician in a multi-specialty group with eight physicians may not have detailed information on costs of the practice, especially costs that are incurred by or on behalf of other physicians in the group. Indeed, empirical analysis in the preceding chapter indicates that a physician's busyness and practice size are directly related to the likelihood that a proxy respondent will be used.

Data from the 1988 PPCIS can be used to examine whether proxy respondents are more knowledgeable concerning costs than physician respondents. It is hypothesized that proxy respondents are more knowledgeable in larger practices. The cost structures of larger practices are more complex. In these settings, cost information is relatively difficult and costly for physicians to obtain. In smaller practices, however, observed differences in knowledge may not be as apparent; proxy respondents are more likely to engage in a variety of administrative activities and less likely to function only as business managers.

The PPCIS contains questions on the major components of costs facing the practice. These include wages paid to physicians and non-physician employees, the costs of occupancy (primarily rent and depreciation of office space), and the costs of medical equipment and supplies. The survey also includes questions on amounts of deferred compensation and fringe benefits for practice physicians and non-physician employees. The PPCIS analysis file indicates whether personnel costs -- including wages, deferred compensation, and fringe

benefits -- were reported separately by the respondent or whether the respondent reported only the less-detailed cost aggregates.

Two indices of respondent knowledge were calculated from the survey data. "Don't Know" (DK) response rates for physicians and proxy respondents were calculated for PPCIS questions on the most important determinants of practice costs -- wages, costs of medical equipment, and supply costs. Rates were calculated by dividing the number of DK responses by the number of physicians participating in the survey, less the number that refused to answer the question.[1] "Don't Know" rates were also calculated for deferred compensation and fringe benefit amounts. In the calculation of these rates, a DK response indicates that the respondent was unable to report the cost amount, either separately or as part of a total cost of compensation. "Don't Know" response rates were calculated for physician and proxy respondents, by practice size. Two size categories were used: small practices, defined as those with three or fewer full-time-equivalent physician "owners," and larger practices with more than three physician owners.[2] Differences in DK rates by type of responder and practice size have survey design and health policy implications as discussed below.

A second index of respondent knowledge is whether the respondent was able to separate personnel costs into their wage, deferred compensation, and fringe benefit components. The rate at which respondents were able to provide such detail (hereafter, the "detail rate") was calculated by dividing the number of respondents who provided the detailed information by the total number of physicians participating in the survey, less those who refused to answer the series of compensation questions. The detail rate was also calculated for both types of respondents, by practice size.

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[1] Rates of refusal do not vary by type of respondent. Item refusal rates for several cost questions are displayed in the Appendix.

[2] As in Chapter 2, practice size is defined as the number of full-time-equivalent physician owners or partners of the practice.

3.3 Findings

3.3.1 Don't Know Rates

Don't Know rates from the PPCIS can be used to examine (i) relative differences between proxy and physician response, given practice size; (ii) differences in proxy response by practice size; and (iii) differences in physician response by practice size.

Relative Differences in Proxy and Physician Response. Proxy respondents in large practices are more knowledgeable (or at least more willing to provide the requested information) than physician respondents (Table 3-1). Reported DK rates for all eight data items are greater for physicians than for proxy respondents of practices with more than three physicians, and are statistically significant at an alpha level of 0.05 or better. The DK response rate for physician wages (3.7 percent) was seven times greater than the rate for proxy respondents (0.5 percent). All proxy respondents in the analysis sample were able to report non-physician employee costs, while 3.0 percent of physicians were not. Four times as many physicians as proxy respondents were not able (or willing) to report medical supply expenses (6.4 percent versus 1.6 percent).

At the same time, there is no evidence indicating that proxy respondents are more knowledgeable than physicians in small practices. DK rates for proxy respondents are at least as large as physician rates for four of the eight data items displayed in Table 3-1. Proxy respondents in small practices appear less willing or able to provide information on remuneration of physicians. More than twice as many DKs were reported in data collection from proxy respondents (2.4 percent) as from physicians themselves (1.3 percent) in response to the question on the amount of deferred compensation for physicians.

Differences in Proxy Response by Practice Size. Don't Know rates for proxy respondents differ by practice size. Proxy respondents in large practices are more likely to provide information than respondents from smaller practices. Don't Know rates for proxy

Table 3-1: "Don't Know" (DK) Rates for Physician and Respondents, by Size of Practice

	Physicians ≤3		Physicians >3	
	Physician	Proxy	Physician	Proxy
Physician costs				
wages	1.3	2.4	3.7[c]	0.5[a,b]
deferred compensation	2.2	4.5a	6.3[c]	1.9[a,b]
fringe benefits	3.9	4.1	6.8[c]	1.7[a,b]
Office employee costs				
wages	1.4	1.8	3.0[c]	0.0[a]
deferred compensation	2.9	2.9	6.0[c]	1.6[a]
fringe benefits	4.0	3.6	3.9	1.4[a,b]
Medical equipment costs				
depreciation	10.5	9.2	9.4	7.4
Medical supply expenses	5.0	4.3	6.4	1.6[a,b]

Source: Analysis of 1988 PPCIS data by Project HOPE.

Note: [a] Different from rate for physician respondents in practices of same size category, alpha = 0.05.
[b] Different from rate for proxy respondents in small practices, alpha = 0.05.
[c] Different from rate for physician respondents in small practices, alpha = 0.05.

respondents of large practices are consistently less than in small practices. Differences are statistically discernable for the questions of physician costs, non-physician fringe benefits, and the costs of medical supplies. The likelihood that a proxy respondent in a small practice was unwilling or unable to provide data on physician wages was more than four times greater than for the average, large practice proxy respondent.

Differences in Physician Response by Practice Size. The physician appears to be a more knowledgeable source of cost data in smaller practices than in larger practices -- especially for data on employee costs. The DK rate of physician respondents in small practices was 1.3 percent for physician wages, versus 3.7 percent in large practices; the DK rate for wages of office employees was twice as large for physicians in large practices (3.0 percent) as for physicians in small practices (1.4 percent).

3.3.2 Detail Rates

The second measure of respondent knowledge is the "detail rate" -- a measure of the extent to which a respondent was able (and willing) to report cost information in a disaggregated form as requested by the interviewer. The availability of data describing the components of physician and non-physician employee costs is presumed to be an indicator of respondent knowledge; more detailed information on the composition of employee costs is also presumed to be of more potential policy usefulness than the aggregate of total labor costs.

Evidence on differences in detail rates between respondents and by practice size is mixed. For physician compensation, no differences between the detail rates of physicians and proxy respondents in large or small practices are observed (Table 3-2). Furthermore, rates for proxy respondents are similar in large and small practices, and detail rates of physicians are comparable in large and small practices.

Table 3-2: Detail Rates for Physician and Proxy Respondents, by Size of Practice

	Physicians ≤3		Physicians >3	
	Physician	Proxy	Physician	Proxy
Data Item				
Physician fringe benefits and deferred compensation	79.9	78.6	73.9	76.6
Employee fringe benefits and deferred compensation	80.2	82.4	76.7	95.2[a,b]

Source: Analysis of 1988 PPCIS data by Project HOPE.

Note: [a] Different from rates for physician respondents in practices of same size category, alpha = 0.05.
[b] Different from rate for proxy respondents in small practices, alpha = 0.05.

For nonphysician employee costs, however, some differences in detail rates are apparent (Table 3-2). Proxy respondents in large practices were most able to provide detailed information on employee costs. Ninety-five percent of proxy respondents in large practices provided full, disaggregated employee cost information, while only 77 percent of physicians in large practices responded with full information. Relatively more proxy respondents provided complete information on employee costs in larger practices than in smaller practices (95 percent versus 82 percent). Point estimates of detail rates for physicians in small practices exceed those in large practices, but are not different at the 0.05 level of statistical significance. The employee cost detail rate for proxy respondents in smaller practices (82 percent) does not significantly differ from the rate for physicians (80 percent).

3.4 Implications

The central question addressed above is whether physician or proxy respondents are more "knowledgeable" about practice costs. Two measures of knowledge were considered: the fraction of respondents who provided responses to questions about key components of practice costs -- in other words, the fraction of respondents who were able and willing respondents -- and the fraction of respondents who were able and willing to provide details on the breakdowns of physician and nonphysician compensation. Several conclusions follow, based on statistical analysis of the two measures.

First, proxy respondents are more knowledgeable than physician respondents in large practices (practices with more than three physicians). One explanation for this finding is that the typical large practice, proxy respondent is a person with financial responsibilities. Large practices are large enough to support the hiring of specialized financial personnel whose responsibilities require a general knowledge of the entire practice. This explanation is supported by the second conclusion: proxy respondents in large practices are more knowledgeable than proxy respondents in small practices. Proxy respondents of small practices are likely to serve a number of functions, including general office personnel

management and clerical tasks. The final conclusion is not independent: in general, physician respondents in small practices appear to be more knowledgeable about practice cost matters than their colleagues in large practices.

These conclusions have implications on the design of practice cost surveys. Research is needed to directly determine whether physician and proxy respondent-provided data are valid, and to what extent proxy respondents are more likely to have financial responsibilities within the practice. Evidence from this chapter suggests that proxy-provided information from large practices may be better than information from the physician respondent. If so, then practice cost surveys of physicians in large practices should be designed specifically to collect data from proxy respondents.[3] Physicians would support this change, to the extent that busy physicians are the most reluctant to participate in cost surveys. Failure to do so may introduce biases that affect public policies, such as distorted practice expense payment levels. Such a design change would be especially important as the average size of medical practices continues to increase and proposed health reforms tend to encourage the growth of physician groups.

[3]This assumes that a survey is the mechanism of choice for collecting needed practice cost information. This assumption is challenged in the next chapter.

CHAPTER 4:

SHOULD SURVEY DATA BE USED TO ESTIMATE PHYSICIAN PRACTICE COSTS?

4.1 Background

Accurate estimation of the components of physician practice costs has traditionally been an area of concern to health policy makers. Practice expense -- defined in physician payment reform legislation as the total of practice costs, less the costs of physician labor and malpractice premiums -- is a critical component in the calculation of payments that physicians receive for providing care to the Medicare population. An estimated 40 percent of payments under the new Medicare Fee Schedule is based on practice cost survey data (Federal Register, 1991). The Health Care Financing Administration has conducted the PPCIS periodically, and its data have been used to update payments to physicians. If practice costs are not accurately reported, payment levels may be inaccurate.

Over the last ten years, there has been a growing body of primarily unpublished research which evaluates the problems associated with conducting physician surveys. In this chapter, some of these findings are reviewed and synthesized. Should surveys of physicians be used to measure practice costs? Should other ways to obtain information on practice costs be considered?

In the next section, the ways in which sources of error relate to physician practice cost surveys are reviewed. Rates of unit and item nonresponse over time are reviewed. While there is a trend toward lower unit response rates and higher item response rates, cumulative response rates have fallen in recent years. Various potential sources of measurement error are also reviewed. The chapter concludes by questioning whether

physician surveys should continue to be used as a source of practice cost data; other methods that could result in more accurate measures of practice costs are suggested.

4.2 Types of Error

The framework for this discussion is the topology of bias used by Groves (1989). Biases in practice cost surveys may arise from four major types of errors: sampling error, coverage error, nonresponse error, and measurement error.

4.2.1 Sampling Error

Sampling error is a function of sample size and design effects. It refers to the level of variance of estimates produced from survey data. Among the key estimates from practice cost surveys are cost estimates by specialty. Estimates are often based on cell sizes of between 100 and 200 per specialty. When the analyses require further breakdowns, such as estimates for urban and rural comparisons, estimates have relatively high variances due to sampling error. Although sampling error does not in itself lead to bias, practice cost estimates may suffer from a lack of precision because of sampling error.

4.2.2 Coverage Error

Coverage error occurs when members of the target population have no chance of selection into the sample. Of the four major types of bias in the Groves' topology, coverage error is probably the least important source of bias for physician practice cost surveys. Sample selection for the major surveys that have focused on practice costs, including the PPCIS and surveys sponsored by the Physician Payment Review Commission (PPRC), and the American Medical Association (AMA), is based on the AMA's Physician Master File as the sampling frame. This file is designed to include the universe of all practicing physicians. Although there has been relatively little formal evaluation of the AMA Masterfile, it is continuously updated. Researchers generally have assumed coverage bias to be small. The

AMA Masterfile is regarded as the "model" for development of other list frames for different types of medical providers (Schoenman, 1988).

4.2.3 Nonresponse Error

Nonresponse error is a potentially serious source of error arising from surveys of practice costs. There are two types of nonresponse error. Unit nonresponse error occurs when physicians refuse to participate in any part of the survey; item nonresponse error may occur when the physician fails to complete critical portions of the survey, as when physicians refuse to provide data on certain components of practice costs. The total level of nonresponse error is a multiplicative function of unit nonresponse and item nonresponse rates.

Unit Response Rates. Table 4-1 displays data on the response rates obtained by economic surveys of physicians sponsored by the federal government. Two federally sponsored surveys have obtained response rates in excess of 70 percent: the Physician's Practice Survey and the Patients' Identified Physician Survey of the National Medical Expenditure Survey (NMES) pretest. Both of these surveys were designed as significantly shortened versions of the PPCIS; response rates of 69 and 61 percent were obtained in 1969 and 1988, respectively.

Fifteen years ago, the American Medical Association was obtaining response rates on physician practice surveys that were significantly below those obtained by the federal government. This pattern has reversed. During the period between 1967 and 1977, response rates for the AMA's Periodic Survey of Physicians declined from 70.4 percent to 48.7 percent. After viewing this decline, the AMA redesigned the survey and began fielding the Socioeconomic Monitoring System (SMS) surveys which relied primarily on the use of the telephone. Response rates have steadily increased from 60.3 percent in 1988 to 72.1 percent in 1989, in contrast to government response rates of 61 and 62 percent in the late-1980s.

Table 4-1: Response Rates of Government-Sponsored Surveys of Practice Costs

Year	Title	Sponsor	Response Rate
1977	Physician's Practice Survey	NCHSR	74
1983	Physicians' Practice Cost and Income Survey (PPCIS)	HCFA	69
1986	Patients' Identified Physician Survey (NMES Pretest)	AHCPR	89
1988	Physicians' Practice Cost and Income Survey (PPCIS)	HCFA	61
1988	National Survey of Physicians (NSOP)	PPRC	62

In recent years, response rates to the AMA surveys have declined from 72.1 in 1989 to 64.4 percent in 1992. During the last five years, the federal government has not conducted any national practice cost surveys. The decline in response rates to the AMA surveys during the 1980's, however, should be of concern to the government.

The reasons for this decline are not clear. Hostility to federal policies regarding physicians is sometimes seen as a obstacle to obtaining high response rates on federal surveys, but Berk et al. (1989) found no evidence that this was a major factor. Another possible reason relates to changes in physicians' practices themselves. Physicians' practices have grown larger, and individual physicians may be under increased pressure to reduce time spent on administrative activities, including participation in surveys. In some cases, physicians may lack the autonomy to release practice information without approval from the group's or corporation's governing body. This helps explain the observed relationships between use of proxy respondents, practice size, and physician busyness reported in Chapter 2.

While physician surveys generally achieve lower response rates than other types of social surveys, it is not always clear what effect nonresponse error has on final survey estimates. Several evaluations of physician surveys indicate that the addition of late responders did not lead to a more representative sample (Berk, 1985; Guadagnoli & Cunningham, 1989; Sobal & Ferentz, 1989). While researchers should certainly try to improve response rates, they should be cognizant of the effect such efforts will have on overall bias. As Berry & Kanouse (1987) note, "A higher response rate will not always result in a more representative sample. In fact, some methods of boosting response rates may do so at the expense of introducing further bias because some methods of boosting response rates will appeal more to some type of respondents than others" (p. 112).

Item Response Rates. Despite the trend toward lower unit response rates, there is evidence to suggest that item response rates are improving. This is significant -- too often, researchers focus only on levels of unit nonresponse even though "missing data on specific

items is much more a part of the measurement process than is unit nonresponse" (Groves, 1989, p. 156).

Item response rates on the 1988 National Survey of Physicians (NSOP) were much higher than on the 1983 PPCIS. The NSOP had a total of approximately 250 questions. About 64 percent of the questions had an item nonresponse rate of less than 10 percent, whereas only 10 percent of the questions had item nonresponse rates that exceeded 30 percent (Berk et al., 1988).

In the NSOP, item nonresponse rates were generally low for questions on Medicare assignment, practice arrangements, and most components of practice costs. High item nonresponse rates were obtained for questions relating to equipment purchase and maintenance costs. For example, more than 40 percent of respondents did not attempt to report the purchase costs of an X-ray machine, lease payments for maintenance costs of X-ray machines, or maintenance contracts for EKG machines and mammography equipment.

Comparison of the 1988 and 1983 PPCIS surveys also indicates significant improvement in item response rates (Project HOPE, March, 1991). In the 1988 PPCIS, 65 percent of all questions had item nonresponse rates of between zero and five percent. This is a dramatic improvement over the 1983 PPCIS, in which only 20 percent of the questions achieved this low level of item nonresponse. There was considerable improvement in rates for questions concerning malpractice insurance for all practice members, tax deductibility for professional costs, and questions related to the depreciation of equipment.

These findings suggest that there is an inverse relationship between unit nonresponse and item nonresponse. It is possible that as pressures to obtain participation from reluctant providers increase, data quality deteriorates. In examining data from the 1977 Physician's Practice Survey, Berk (1985) found that as the survey period went on, there were significant decreases in the percentage of cases in which the interviewer rated the cooperation of the respondent as good or excellent. There also was a decline in the number of respondents who

answered the physicians' total income question -- one of the key data items in the survey -- during the field period.

Cumulative Response Rates. It appears that over the last decade, unit response rates have declined while item response rates have improved. More physicians are declining to participate in surveys, but those that do participate are providing more complete information. Cumulative response rates can be obtained by multiplying the survey participation rate by the percentage of valid responses received on each question. Table 4-2 presents cumulative response rates for the AMA's SMS core surveys conducted between 1982 and 1992.

During the six-year period between 1982 and 1988, cumulative response rates clearly improved for each of the seven variables considered. Reporting of total expenses steadily improved from 38 percent in 1982 to 50 percent in 1990. Reporting of liability premiums similarly improved from 38 percent to 57 percent. Large improvements were also found in the reporting of office expenses, non-physician supplies, payroll, equipment, and other expenses. Unfortunately, however, trends have been somewhat erratic. Since 1988, there have been declines in cumulative response rates for total expenses, liability premiums, and non-physician supplies. Reporting on office expenses, non-physician supplies, payroll, other expenses and equipment have remained relatively stable. These findings suggest that problems of nonresponse are potentially serious. In 1992, the cumulative response rate for each of the seven variables considered was 48 percent or less. In designing future practice cost surveys, researchers should be cognizant of the effect of both item nonresponse and unit nonresponse. At the present time, it should be acknowledged that cumulative nonresponse rates are exceeding the levels most health service researchers would find desirable.

4.2.4 Measurement Error

Measurement error can result from at least four different sources: 1) the respondent; 2) the interviewer; 3) the questionnaire; and 4) the mode of interview. Measurement error

Table 4-2: The Product of Survey Response and Item Response Rates for Selected Practice Cost Questions

Year	Total Expenses	Liability Premium	Office Expenses	Non-physician Supplies	Payroll	Other Expenses	Equipment
1982	0.38	0.38	0.34	0.33	0.33	--	0.32
1983	0.37	0.43	0.39	0.38	0.39	0.36	0.36
1984	0.40	0.49	0.43	0.42	0.43	0.41	0.40
1985	0.41	0.48	0.42	0.41	0.42	0.40	0.39
1986	0.41	0.49	0.42	0.41	0.42	0.40	0.38
1987	0.44	0.51	0.41	0.39	0.40	0.39	0.37
1988	0.47	0.54	0.44	0.42	0.43	0.41	0.40
1989	0.50	0.56	0.48	0.46	0.47	0.45	0.44
1990	0.50	0.57	0.51	0.49	0.50	0.48	0.48
1991	0.44	0.52	0.44	0.41	0.44	0.40	0.40
1992	0.41	0.48	0.43	0.41	0.44	0.41	0.40

Source: AMA's Socioeconomic Monitoring System Core Surveys.

occurs when respondents give inaccurate answers or an accurate answer is incorrectly coded. Measurement bias is likely to be a particularly serious problem in surveys of physician practice costs. The type of information requested in these surveys is unusually detailed and often quite burdensome to the physician. Although some evidence presented in Chapter 2 suggests that proxy respondent-provided information may be better than information from physician respondents, surveys have been designed primarily to obtain information directly from physicians. In many cases, the physician must refer to records in order to respond accurately. In other cases, the physician may not have the records available to provide the requested information, but may instead offer a poorly thought-out estimate in a misguided attempt to be helpful. Interviewers rarely are trained to understand the implications of such "guesstimates." In many cases, it is preferable to impute a missing value rather than to encourage a physician to give an answer that may be inaccurate. Because obtaining high response rates on physician surveys is so difficult, interviewers may also be giving inappropriate positive reinforcement to physicians who are proceeding through the survey without break off even though they do not appear to be answering questions thoughtfully.

Researchers often conduct verification surveys or record checks to accurately determine the level of measurement bias and make appropriate adjustments. However, such checks are not possible in surveys of physicians. This is why the survey methods literature on physicians surveys is so sparse compared to surveys of other types of social phenomena. In the vast majority of cases, we have no "gold standard" to which survey estimates can be compared.

One indirect method of assessing the validity of answers obtained on surveys of physicians is to examine the logical consistencies between answers. On the 1988 NSOP, total practice costs were measured in two ways. First, data were collected about the specific components of practice costs, including office space, purchase of equipment, maintenance of equipment, and wages and benefits. The individual practice cost components were summed and compared to the response to a separate survey question that asked for an estimate of total practice costs. For 73 percent of the cases for which data were obtained for all practice

components, the constructed sum of the measures differed by more than 10 percent from the total practice cost measure obtained using the single question. There did not appear to be any pattern of overestimating or underestimating specific practice cost items (Berk et al., 1989). Similar findings were reported in an analysis of a pilot survey designed to measure practice costs: "The most serious data quality problems are inconsistencies between total practice expenses and the constructed sum of all cost items and between total nonphysician wages and the constructed sum from numbers of full-time equivalent employees and average wage rates. For most respondents, inconsistencies between these data elements range from a few percent to over 50 percent" (Brown. 1990, p. 43).

Mode of interview is another potential source of measurement bias. Although most physician surveys are designed to be completed directly by the physician, interviewers usually are allowed to accept the answers from a proxy if the physician cannot or will not respond directly. As indicated above, the designation of a proxy respondent is not random. The physician's decision to be interviewed directly is largely a function of practice size (Chapter 2) and perhaps the physician's value of time (Marder and Thran, 1989): group and more highly paid physicians are more likely to ask proxy respondents to complete survey interviews for them. This is a potential source of measurement bias.

4.3 Findings and Conclusions

Although physician surveys have been conducted on a regular basis and are used by the federal government to affect payments, there is little solid empirical evidence to suggest that these data are accurate. Because there are no pure standards which can be used to assess the potential magnitude of bias, no definitive conclusions are possible. Nevertheless, the high levels of unit nonresponse coupled with high levels of item nonresponse for a small but important set of practice components are of concern. Moreover, significant logical inconsistencies between data elements have been reported. Factors such as the use of proxies and the utilization of computer-assisted telephone interviewing also appear to affect results (Project HOPE, 1991).

To the extent that surveys fail to measure practice costs accurately, payment rates may be inequitable both for the physician as well as for the patient who pays for services. Results from recent surveys would suggest the need for additional methodological inquiry. In particular, it would be worthwhile to pursue smaller-scale studies of practice costs that would allow for a validation analysis. Obviously, the cost of such inquiry is high, but in view of the need to obtain more accurate estimates, such investment is worthwhile. There are several different formats that could be explored.

Physicians who initially respond to a physician practice cost survey could be re-interviewed by a more elite group of survey interviewers who would ask detailed questions about how the physician was answering specific questions. Another option is to recruit a sample of physicians to participate in focus groups designed to provide more information about the responses given during the survey. It also may be useful to conduct a small-scale study of financial records. If strict confidentiality can be guaranteed, it is possible that a number of physicians who recognize the importance of these data in calculating payment rates would agree to participate.

Finally, we would recommend that policy makers consider the possibility of developing alternative methods of collecting data that rely less on large, national survey efforts. For many services and procedures, the work component of the relative value scale (which underlies the new Medicare Fee Schedule) has been developed using expert panels in which consensus is reached about the amount of time physicians should spend performing specific procedures. A similar methodology could be applied to estimate practice expense components. It could be argued that such a methodology is preferable for the formulation of public policy. The goal would be to determine appropriate practice costs, rather than to estimate average costs. Expert panels could attempt to reach consensus on the appropriate equipment, staffing, and other resources that should be associated with specific types of localities in specifically designated markets. While such a methodology is subject to error, it is not clear that it would be any less accurate than the far more burdensome survey procedures currently used. As an initial step, such panels could be conducted for three to

four specialties and the results compared to those obtained from traditional practice surveys. This may inform policy makers on how to modify existing surveys, or whether to replace them with a methodology that relies less on the ability of physicians or their proxies to report detailed information about costs.

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APPENDIX:

RATES OF REFUSAL FOR PHYSICIAN AND PROXY RESPONDENTS, BY SIZE OF PRACTICE

Appendix: Rates of Refusal for Physician and Proxy Respondents, by Size of Practice

	Physicians ≤3		Physicians >3	
	Physician	Proxy	Physician	Proxy
Physician costs				
wages	7.2	7.9	8.0	5.5
deferred compensation	6.9	7.4	6.3	4.8
fringe benefits	6.8	7.4	6.8	4.4
Office employee costs				
wages	3.4	3.2	2.1	1.6
deferred compensation	3.0	3.4	2.1	1.6
fringe benefits	3.2	3.4	2.1	1.8
Medical equipment				
depreciation	1.0	2.0	0.8	0.7
Medical supply				
expenses	1.1	1.8	0.8	0.9

Source: Analysis of 1988 PPCIS data by Project HOPE.
Note: Differences between physician and proxy rates (for each practice size category) are not statistically significant at an alpha level of 0.05.

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